Colonel W. S. (Steve) Flaherty
Superintendent

(804) 674-2000

COMMONWEALTH of VIRGINIA

Lt. Col. Robert B. Northern
Deputy Superintendent

DEPARTMENT OF STATE POLICE

P. O. BOX 27472, RICHMOND, VA 23261-7472

August 30, 2007

BY OVERNIGHT COURIER

Marlene H. Dortch, Secretary
Federal Communications Commission
Office of the Secretary
9300 East Hampton Drive
Capitol Heights, Maryland 20743

Re: Commonwealth of Virginia – STARS
Waiver Request – In re Implementing a Nationwide Broadband, Interoperable Public Safety Network in the 700 MHz Band; Development of Operational, Technical and Spectrum Requirements for Meeting Federal, State and Local Public Safety Communications Requirements Through the Year 2010
PS Docket No. 06-229, WT Docket No. 96-86, *Second Report and Order*, FCC 07-132 (rel. August 10, 2007) (*Second Report and Order*).

Dear Sirs:

The Commonwealth of Virginia requests that the FCC grant it a waiver of the provisions of Paragraph 339 of the referenced Second Report and Order of certain narrowband operations. Specifically, a waiver is requested of the Commission's first sentence in Paragraph 339; *"As an additional measure to clearly define and contain the costs that would be entitled to reimbursement, we prohibit authorization, whether pursuant to individual license or State License, of any new narrowband operations in channels 63 and 68, or in the upper 1 megahertz of channels 64 and 69, as of 30 days following the adoption date of this Second Report and Order."*

The Commonwealth further requests that the FCC grant it a waiver of the provisions of Paragraphs 339 and 341-341 of the referenced Second Report and Order limiting relocation cost reimbursement to equipment in operation as August 30, to allow the Commonwealth to include in the costs eligible for relocation funding all handsets and vehicle mounted repeaters which the Commonwealth expects to deploy in connection with its partially-implemented **Statewide Agencies Radio System** (STARS), namely 2875 handsets and 2716 vehicle mounted repeaters.

The Commonwealth further requests that the FCC grant it a waiver of the provisions of Paragraphs 336 and 337 of the referenced Second Report and Order, requiring a report of equipment in operations as August 30, to allow the Commonwealth to list all handsets and

vehicle mounted repeater which the Commonwealth expects to deploy before or after August 30 in connection with its partially-implemented STARS system, namely 2875 handsets and 2716 vehicle mounted repeaters.

The Commonwealth has completed installation of approximately 64% of its STARS 700 MHz portable radios and mobile repeaters. The frequencies installed are in the lower half of the channels assigned in the State's license (Channel Numbers between 25 and 316). All are in the consolidated segment that is to become broadband. To change to the new frequencies within the consolidated narrowband spectrum now will force law enforcement and other STARS users to operate in two disparate frequency sets with one group unable in some cases to communicate with the other. In major state emergencies (recent examples would the 9/11 attack on the Pentagon, the beltway sniper, Virginia Tech massacre, and hurricanes) troopers and other officials from across the Commonwealth are deployed to the area affected by the crisis. If this waiver is not granted, portable radios and vehicular repeaters will not be able to directly communicate with each other. Even if we were to introduce the new frequencies on September 1, 2007, and operate in some to-be-determined, degraded mode of operations, subscriber installations could take months to resume. Both cases are critical officer and citizen safety issues that need to be avoided.

The Commonwealth of Virginia Statewide Agencies Radio System (STARS) is built on the foundation of the recognized need for a shared, statewide, industry standard (Project 25) public safety-grade radio system that complies with FCC narrow banding initiative and integrates mobile data to efficiently use spectrum. STARS facilitates interoperability between 22 participating state agencies and 134 locality communications systems at the city or county level. The FCC has previously recognized the need for this statewide system in granting specific approval to the Commonwealth to purchase and utilize maritime and commercial channels as part of STARS. In fact, the Commonwealth would submit that these approvals constitute a previous authorization of STARS, which the new Second Report and Order did not intend to revoke.

The Virginia General Assembly has provided yearly appropriations to fund deployment of STARS, establish and maintain the STARS project management office, and to retain an engineering consultant hired in July 2000. To date, the Commonwealth of Virginia has appropriated more than $361 million for STARS.

The STARS Integrated Voice and Data (IV&D) LMR system is designed for VHF mobile (not portable) coverage statewide. This presents a problem when the officers leave their vehicles, as they will be out of radio contact with their dispatchers. The solution implemented for this is to provide a low power 700 MHz vehicular repeater to extend the use of the VHF mobile radio within a short radius (less than one mile) of their vehicle. The VHF traffic from the mobile radio

to the subscriber's portable radio is rebroadcast in conventional Project 25 digital mode at 700 MHz and the 700 MHz portable radio traffic is rebroadcast by the repeater at VHF in a Project 25 trunked mode.

Vehicular repeaters are used not only in routine public safety operations such as traffic stops by Agency officers, but also during major incidents. The participating STARS Agencies utilize these 700 MHz vehicle mounted repeaters extensively.

The STARS Microwave and Integrated Voice and Data Networks are currently under construction. The Richmond Division and Chesapeake Divisions have been constructed and are in active use. The contractor, Motorola, is in the process of installing the 700 MHz vehicle mounted and handset equipment for the entire Commonwealth. The Commonwealth has contracted for and has already purchased the 700 MHz equipment for this project.

The following is the current STARS project implementation schedule:

1. Contract Awarded to Motorola	July 13, 2004
2. Richmond Division Operational – Demonstration	December 2005
3. Richmond Division Operational – Users Transitioning to STARS	January 2006
4. Chesapeake Division Operational	June 2007
5. Culpeper Division Operational	July 2008
6. Fairfax Division Operational	October 2008
7. Salem Division Operational	April 2009
8. Appomattox Division Operational	May 2009
9. Wytheville Division Operational	September 2009
10. Final Full System Acceptance	October 2009

The FCC 07-132 Second Report and Order sets August 30, 2007 as the effective date for certifying equipment in active use. Second, DA 07-3644 states that no new narrowband operations will be permitted as of August 30, 2007 in 764-767/794-797 and 775-776/805-806 MHz bands. The defined date of August 30, 2007 is in conflict with the STARS project implementation plan.

The FCC's order to operate only on the new narrowband frequency blocks has placed the Commonwealth of Virginia in the untenable position of having to most likely cease vehicle installation on August 30th (not a good situation in hurricane season). The Commonwealth cannot simply cease installing equipment as of this date without jeopardizing officer and citizen safety and even the project itself.

In addition, while the FCC's order permits public safety agencies to place 700 MHz narrowband equipment into operation on the consolidated narrowband blocks after the August 30, 2007 deadline, funding and direction relating to the reconfiguration of equipment currently operating in the rebanded frequencies has not been provided. Complying with the order will place the Commonwealth in a situation where the 700 MHz equipment installed before August 30th will be incompatible with that installed after this date, until the pre-existing equipment can be rebanded.

Replacing/reprogramming the code plugs to reconfigure the currently installed STARS equipment could require months. Forcing the project to cease installation of 700 MHz portable/repeater equipment in inventory will effectively force STARS users to revert to a mobile-only system, presenting the Commonwealth with extreme officer safety and operational issues.

The Commonwealth respectfully requests that the FCC reconsider the effect of enforcing a fixed date on a project with equipment already purchased and with project rollout already underway. The Commonwealth also requests that it be permitted to continue installation of 700 MHz as contracted on the original narrowband frequency blocks to allow compatibility between all equipment in the entire 700 MHz system until the 700MHz reconfiguration plan has been defined and funded, so it can safely, efficiently and effectively migrate to the new narrowband channel blocks.

The Commonwealth respectfully requests that it be allowed to complete deployment of the STARS system on the original narrow band frequency as contracted for, certify all contracted equipment units for reimbursement, and be eligible to receive relocation funding reimbursement for all contracted equipment units.

While we realize that our portable and repeater system must be rebanded at some point, which effort needs to be accomplished in a planned way that minimizes the operational and officer safety issues inherent in such an effort. The Commonwealth would request that it be allowed to perform its 700 MHz and 800 MHz rebanding together by the earlier of January 31, 2009, the 700 MHz relocation date established for its system by the National Public Safety Broadband Licensee in conjunction with the commercial partner, or the earlier of any 800 MHz rebanding requirements.

In support of the foregoing waiver and system deployment requests, the Commonwealth assures the FCC that (i) the Commonwealth has already placed a significant portion (approximately 40%) of its STARS system in place, (ii) the Commonwealth will act in good faith to place all equipment in operation to the extent technically feasible by August 30, and (iii) the Commonwealth has a definitive deployment schedule for each piece or category of STARS equipment by division.

In support of this waiver and system deployment request, we are including documents supporting the subscriber quantities. A copy of the complete, signed contract with all amendments is located at WWW.VSP.Virginia.Gov.

If you have any further questions concerning this project, please contact Mr. Thomas Struzzieri (STARS Project Manager) at 804-674-4684 or Thomas.Struzzieri@VSP.Virginia.Gov.

Since the Commonwealth is in the process of deploying the STARS system, and needs certainty in its public safety operations, we would respectfully request that this waiver request be acted upon promptly and favorably.

Sincerely,

COMMONWEALTH OF VIRGINIA
VIRGINIA STATE POLICE

By: _____
Captain John E. Furlough
Communications Officer

JEF/TAS/tlt

cc: Derek Poarch, Policy Division, Public Safety and Homeland Security Bureau
Dana Shaffer, Policy Division, Public Safety and Homeland Security Bureau:

State of Virginia, STARS Project
Motorola
Schedule Update Narrative Report
7/27/2007

Schedule Summary
The Master Schedule has been updated and revised to reflect the current direction and progress on the State of Virginia, STARS Project as of Tuesday, July 24, 2007. Final Project Acceptance is currently scheduled to occur on April 20, 2010, One Hundred Sixty Five (165) work days behind the Original Contract Completion Date of September 2, 2009

Schedule Update, Revisions
Control Stations have been added to the schedule. Only minor changes in actual completion and start dates noted.

Civil Infrastructure
Sites currently under construction, Long Mountain started construction June 18th, Accomac is started June 28th, and Pinnacle Ridge started construction June 25.

Divisions
First Division 100% complete, Fifth Division 93% complete, Accomac, and Tunnels are still outstanding tasks to be completed in November. Second Division is 67% complete. Sixth Division 29% complete, Third Division 52% complete, Fourth Division 8% complete and Seventh Division 39% complete.

Division Completions

Division	Original Scheduled Finish Date	Schedule Finish Date
Division 1	14-June-06	20-Mar-07(Actual)
Division 5	08-May-08	08-Aug-07
Division 2	24-jul-08	17-July-08
Division 6	14-Apr-09	28-May-09
Division 3	12-May-09	21-Aug-09
Division 4	02-Sep-09	25-Dec-09
Division 7	31-Oct-08	22-Mar-10
123 Sites Constructed	13-Aug-07	

Agency Fleet Mapping
Agency Fleet mapping is at 91% on all remaining Agencies i.e. CBBT, DFP, VDH, DMA, VPA, and INTEROP.

Subscriber Migration
Subscriber Migration showing 64% complete and is scheduled to complete by May 15, 2008.

State of Virginia, STARS Project
Motorola
Schedule Update Narrative Report
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Training
Training for STARS is 31% complete and ongoing throughout the project.

Mobile DATA Integration
Mobile DATA is 24% complete with Geofile subsystem being the long lead with a completion date of June 23, 2009

Change Orders
CO01 was changed to, Final Contract Negotiations resulting from June 22, 2004 Session.

Delaying Factors
Delays associated with Site Investigation, Owner Approvals and Regulatory Permitting has significantly increased the overall duration of the Site Infrastructure. Originally planned for approximately 30 months, the Site Infrastructure is now projected to have an overall duration of 55 months. Change orders have been implemented with no time extensions to the project.

Notes to Schedule
Meeting minutes have been updated to the notes section of the schedule for civil portion of schedule.
Task to start or complete in the next thirty days are highlighted in green, sixty in blue and 90 in red.

Critical Task
The critical tasks continue to be site acquisition, site design, permitting, and construction. The schedule is 165 days beyond the completion date due to site acquisition, site design, permitting, and construction.

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DEPARTMENT OF STATE POLICE

P. O. BOX 27472, RICHMOND, VA 23261-7472

NOTICE OF AWARD

COMMODITY: Systems Integrator for the Commonwealth of Virginia Statewide Agencies Radio System (STARS)

DATE:	July 14, 2004
FOR:	Commonwealth of Virginia Secretary of Public Safety Thru: Virginia Department of State Police
SERVICE:	90728
CONTRACTOR:	Motorola, Inc.
PRICE:	$329,673,699.00
CONTRACT NO.:	2001-035

END OF POSTING PERIOD, 5:00 P.M.: July 26, 2004

For more information, contact Patricia T. Trent @ 804-674-2444.

Jack L. Armstrong
Supply Section
Material Management Director

Systems Integrator for the Commonwealth of Virginia Statewide Agencies Radio System (STARS) Project

Executive Summary

The Virginia State Police began installation of the existing statewide land mobile radio system in 1977. Many of the radios still in use today are of that vintage. Radios have been reinstalled in approximately six generations (each patrol car is driven in excess of 100,000 miles in a generation) patrol vehicles. This network supports only a single conventional voice channel in any given area. Therefore, severe radio congestion is routine and interoperability cannot be supported on existing channels without further increasing the wait times for the users. In addition, the technology used is not advanced enough to support critically needed law enforcement mobile data.

The Statewide Agencies Radio System (STARS) is built on the foundation of the recognized needs for a shared statewide public safety grade radio system that facilitates law enforcement mobile data and interoperability with the localities. The current State Police land mobile radio (LMR) network will be upgraded with state-of-the-art, industry standard, TIA/EIA 102 technology (also known as APCO Project 25). This equipment standard has been specified collaboratively by multiple user disciplines throughout the country, and by radio manufacturers throughout the world. In addition, the capacity of the network will be increased for a public safety grade of service. The microwave radio network's technology and capacity will be upgraded and disaster recovery alternate paths will be added.

Expenses and resources will be shared by the various participating agencies identified in Executive Order 28 for greater benefit and economy of scale. STARS will provide multi-channel trunked digital voice and data wireless communications that is specifically designed for public safety requirements. The tangible benefit of STARS is to provide essential public safety grade communications that can operate seamlessly throughout the Commonwealth for the 20 state agencies and facilitate interoperability with local governments and federal agencies. The interoperability solutions within STARS allow each locality, at the county and city level, to communicate with users independent of their technology or radio frequency band used. Direct interoperability can also be employed with compatible radios (STARS mobile and portable radios being used on a locality or federal radio network), based upon the situation and the needed on-scene command and control being available. STARS can also interconnect localities with each other if required.

The STARS design is a culmination of partnering with the Commonwealth, the project's engineering consultant HSMM / CTA Communications, and Motorola. Meeting needs, utilizing existing resources, and minimizing risk were heavily weighted design

parameters in developing STARS. Capitalizing on existing infrastructure and resources, whenever possible assists the Commonwealth in the ability to implement STARS in a cost effective manner. Finally, minimizing design risk through the use of Motorola, a proven system integrator and communications manufacturer, along with the use of a redundant, fault-tolerant, hierarchal design that allows for re-routing in case of single point failure. The wireless communications system for the Commonwealth of Virginia contains today's latest technology and will continue to provide updated technology at no additional cost throughout the STARS implementation. STARS allows the Commonwealth to retain a high level of service and security, plus flexibility to add additional users when additional radio frequencies are available. In all applicable design components, STARS has addressed safeguards to system security, including controlled system access, Advanced Encryption Standard (AES) encryption, and multiple security layers. The system infrastructure will serve the Commonwealth for years to come.

In accordance with the Governor's Executive Orders 28, STARS is designed around the premise that the operational needs of each participating agency can be substantially met within practical confines of system cost and radio spectrum limitations. Motorola's ASTRO 25 communication system, which integrates both voice and data, will greatly enhance the current ability for the Commonwealth's agencies to successfully communicate and experience the benefits and efficiencies of a shared wireless communication system.

The STARS Project Management Team, established by Executive Order 28, will oversee the installation, testing, and migration. They will be assisted by the State Police's Bureau of Administrative and Support Services Divisions and two consultants. The State Police Communications Division will provide systems engineering and technical support. Their technical staff that will be performing the infrastructure maintenance and first responder subscriber repair support after the warranty period. The Training Division will provide all first responder user training and coordinate the remainder of the training. The Property and Finance Division will provide civil engineering support and be responsible for the project's property. The Data Processing and Criminal Justice Information Systems Divisions will provide connectivity with state and federal data networks. The participating agencies will provide input and support during the implementation phases, as needed.

Cost

Core System	318,091,943.00
Performance Bonds	222,000.00
Mandatory Maintenance and Configuration Warranty	11,359,756.00

Total System	**$ 329,673,699.00**
Core System List:	
Master Site Equipment	11,295,279.00
Console Dispatch Equipment	7,753,078.00
Remote Site Equipment	21,250,967.00
Building/Shelter Equipment	29,218,178.00
Tower Equipment	24,745,328.00
Facilities Construction/Renovation	2,271,943.00
Transportable Site	911,170.00
Training	4,586,540.00
Project Office – Includes Design and Engineering Services (up to 25 engineers), Project Management, Administrative costs, Office Space, Outside Services and Frequency Planning	54,412,975.00
Equipment Staging	5,310,880.00
Warranty and License/Subscription Agreements	15,896,429.00
Test Equipment and Program Accessories	3,123,598.00
Equipment Spares	10,745,723.00
Radio Subscribers Equipment	24,935,701.00

Installation Discount	-1,990,319.00
Auxiliary Items	18,746,411.00
Control Stations	3,100,477.00
Locality and Legacy Interfaces	7,431,066.00
Portable Radios	14,270,803.00
Data Terminals	15,580,471.00
Aircraft Radios	208,264.00
Mobile Data	6,824,279.00
Channel Banks for IV&D Network	4,380,604.00
Microwave	33,082,098.00
Core System Total	318,091,943.00

Negotiations

The lead negotiator for the Motorola contract representing the Commonwealth was Mr. Steven O. Owens, Senior Assistant Attorney General, Office of the Attorney General. The draft contract was reviewed by other members of the Office of the Attorney General's staff and their proposed revisions included in the final contract document. During the cost negotiations an original offer of $370,751,598 for the total system was received from Motorola. The STARS staff and representatives from CTA Communications analyzed the offer and prepared a counter offer for the total system. During final cost negotiations, a total system cost of **$329,895,699** was agreed to, resulting in a cost reduction of $41,077,899 for the total system. The cost reduction was achieved through a combination of Motorola lowering costs and the Commonwealth adjusting requirements within the contract. Two construction projects, the renovation of a warehouse at State Police Headquarters that will serve as the Network Operations Center and the construction of a new building at the Division Six Headquarters at Salem

that will serve as a master site for the western portion of the state, were removed from the contract. These construction projects will be awarded based on the results of an RFP. After the final cost figure was agreed to, a price reasonableness determination study was conducted and concluded the prices for equipment and services within the contract were reasonable.

STARS Systems Integrator Contract Overviews By Section

1. Systems Integration

The Motorola STARS project team implementation is based on a designed and detailed integration plan. The Motorola Program Director will bring together the people and resources for the STARS project, and then manage them toward meeting every project milestone.

This intensive planning, based on dozens of successful large-scale integrations, reduces risk to the Commonwealth. Important details, such as the execution of the Customer Design Review (CDR), development of the talk group plan, the development of a migration plan for each agency and end user, including the appropriate timing of end user training, are all crucial in the preparation of a successful integration strategy for STARS. A thorough Project Schedule is critical for planning, resources, costing, and risk mitigation. The next step takes the detailed plans and pre-builds the system at the Motorola staging facility, the Customer Center for System Integration, including third-party equipment. The system is then tested, measured, and optimized to ensure it meets the design considerations. Commonwealth employees will be an essential part of the testing and implementation processes.

Much of the work entails coordinating local vendors to secure antenna sites, and erect towers and buildings. The site development phase will be underway while the equipment is being manufactured and staged. The implementation process is broken down into individual tasks in a full project plan, which covers:

- Engineering and design
- Procurement
- Facility construction and upgrades
- Systems installation
- Optimization and testing by system and subsystem
- Agency migration and cutover
- Closeout and Acceptance
- Frequency Planning
- Talk Group (Fleet Map) Development

An essential component in the transition process is the Project Cutover in each Division. After acceptance testing and cutover planning is complete, Motorola will coordinate dispatch and subscribers training, distribute the subscriber equipment, and prepare the end-users for a smooth transition. STARS will be put through a rigorous quality assurance process to make sure all components are configured properly and operating up to specifications. Once the system is working, as designed, the Department of State Police (VSP) will provide the expertise to manage, monitor, and service the system.
Motorola will perform the work and tasks required to design, manufacture, install, optimize, test, and integrate STARS. Motorola will provide the documentation and training to support the operation of STARS to the Commonwealth. Motorola and the Commonwealth will each provide a dedicated project leader to act as the single point of contact for all administrative, technical, and scheduling issues related to the project. The Motorola Program Manager (has not been named) has the overall responsibility for providing the Motorola deliverables required for the implementation of STARS and management of the STARS project schedule. The Commonwealth's Project Director (Captain Michael E. Bolton) has the overall responsibility for ensuring that all Commonwealth responsibilities and tasks are completed per the Contract Schedule.

2. Communications within the Tunnels

Motorola is providing VHF and 800 MHz wireless communication coverage for six tunnels in the Commonwealth of Virginia (Big Walker Mountain, Hampton Roads, Elizabeth River Downtown, Elizabeth River Midtown, Monitor/Merrimack, and East River Mountain). The design allows for effective mobile radio, portable radio, and computer data communications within the tunnels. In addition to being designed for STARS, the tunnel design accommodates the existing VSP communication channels that will increase the effectiveness of the overall Commonwealth migration plan to STARS.

3. 700/800 MHz Transportable Communication Site

To provide additional capacity, interoperability, and support for disaster-recovery operations for STARS, Motorola is providing the Commonwealth a transportable site. This site is designed to be moved and placed into service where needed by the Commonwealth during special events or to handle specific emergency situations or for additional radio system capacity and interoperability. This Transportable Site provides on-site ASTRO 25 digital trunked communication in either the 700 or 800 MHz frequency band, as well interconnection with other systems via an ACU-1000 network interface. The selection of 800 or 700 MHz will follow the completion of the radio frequency channel plan. The entire site can typically be deployed within one hour of the arrival of the trailer at the site.

4. Integrated Voice and Data Network Coverage and Traffic

Through communication between the Commonwealth and Motorola, wireless radio coverage for the Commonwealth of Virginia has been defined. With the advent of integrated voice and data communications, radio coverage is described by both areas of coverage as well as data traffic or throughput. To meet the performance guarantees, Motorola will install 45 ASTRO 25 RF sites, strategically located throughout the Commonwealth.

Voice Coverage

The performance guarantees and test procedures will ensure the Commonwealth will experience clear communications as defined by a Bit Error Rate (BER) test as well as an independent Push-to-Talk Access test. Motorola will provide at least a talk-in and talk-out Delivered Audio Quality (DAQ) of 3.4 or BER of 2%.

The Voice Coverage Guarantee, expressed in percentage of a VSP Division service area, is shown below; the projected coverage is consistent with the current coverage. Note that adding the Columbia Pike site in Division 7 greatly improved coverage in key areas, but did not increase the zone's coverage by an additional percentage point.

Service Area Description	Service Area Coverage Guarantee
Communication Zone 1, Richmond, (Div 1)	95%
Communication Zone 2, Richmond, (Div 1)	94%
Communication Zone 3, Culpeper, (Div 2)	95%
Communication Zone 4, Culpeper, (Div 2)	88%
Communication Zone 5, Appomattox, (Div 3)	95%
Communication Zone 6, Appomattox, (Div 3)	94%
Communication Zone 7, Wytheville, (Div 4)	93%
Communication Zone 8, Wytheville, (Div 4)	92%
Communication Zone 9, Tidewater, (Div 5)	91%
Communication Zone 10, Tidewater, (Div 5)	95%
Communication Zone 11, Salem, (Div 6)	94%
Communication Zone 12, Salem, (Div 6)	93%
Communication Zone 13, Northern Virginia, (Div 7)	91%
Major Waterway Communication Zone	88%

Data Coverage

STARS will provide successful delivery of a message/packet both from a vehicle as well as from a dispatch or 'host' location, as defined within the Contract guidelines.

Voice and Data Tunnel RF Coverage

In 95% of the bore length of the six tunnels, STARS will provide a voice DAQ of 3.4 for the VHF system or a 95% Message Success Rate for data communications. Motorola will provide a DAQ of 3.4 for the 700/800 MHz system in 95% of the bore length of the tunnel and extending 100 feet outside the tunnel entrance. In order to minimize the negative effects of too many signals around the tunnel entrances, there will be a built in 100-foot buffer zone between the in-tunnel VHF system and the outside VHF system. This zone will be covered by portable coverage via a vehicle outside of the tunnel in the event of sustained wireless radio needs.

Traffic Loading

The Traffic Grade of Service (GOS) for the VHF IV&D system are based on public safety grade needs and those parameters have been used to define the performance guarantees STARS will provide the Commonwealth. The performance testing takes into consideration the cross-functional use of voice, data and Commonwealth wide talkgroups (note that data traffic is secondary to voice). The system will be configured to support full voice priority allowing the inherent characteristics of data to efficiently fit into the unused data streams. As STARS is a public safety grade system designed to support life and death situations, the system is configured such that voice traffic is given the priority over data messages.

5. Microwave Network

The microwave network will provide the Commonwealth with the digital transport required for interconnecting Land Mobile Radio, Mobile Data, Telephone, and Alarm and Control Networks. In addition, it will be used to replace leased data lines currently connecting VSP sites. It will be highly reliable and capable of supporting government relocation, if required. For instance, the current VSP microwave network (that STARS is upgrading) was quickly reconfigured by the VSP Communications Division at the Columbia Pike Area Office to serve as a command center in response to the 9/11 terrorist attack on the Pentagon. In addition, statewide there were no outages in the VSP microwave network due to Hurricane Isabel.

This network will consist of Digital Microwave equipment of various frequencies and capacities. This microwave network, consisting of Synchronous Optical Networks (SONET) loops, parallel traffic routing and hot standby-protected microwave spurs, will connect all the Land Mobile Radio Integrated Voice and Data transmitter sites. Critical links, will utilize an OC-3 SONET controlled ring providing diverse route protection (commonly referred to as "east–west route diversity").

Each VSP Division Headquarters, most VSP Area Offices, and microwave transmitter sites will be equipped with a phone network that will allow on-site personnel to place and receive telephone calls over the microwave network. This circuit is connected to the Commonwealth's Private Branch Exchange (PBX) and to the Public-Switched Telephone System (PSTN).

6. Mobile Data Applications

A key component of STARS is data and a key component of data is the software applications.

The Premier MDC mobile application being provided will provide the following to the Commonwealth:

- Law Enforcement mobile data
- Intra-agency and inter-agency text messaging,
- POP3 Email Integration to access an MS Exchange Server,
- Interfaces with the VSP Computer Aided Dispatch (CAD),
- Global Positioning System (GPS) support for Automated Vehicle Location (AVL),

The mobile data system will provide mobile data functionality over the ASTRO 25 IV&D network. Motorola is including two client configurations of Premier MDC, one for VSP that offers full VSP CAD Interface capabilities, and one for other sworn officers that do not.

STARS is including an AVL subsystem to identify the location of law-enforcement mobile units with computers in the field. Location data will be sent to a display at the closest division headquarters based upon certain events or from a dispatcher initiated request. This feature is directly intended to support the commitment to maximizing a STARS subscriber users' safety.

7. Alarm and Control

A STARS Network Fault Management (NFM) subsystem will be provided for managing transmitter site/equipment alarms and controlling various site functions. The NFM subsystem collects data automatically, processes that data, and then presents it for the decision maker. This management tool provides a single interface for monitoring equipment and systems alarms over IP (internet protocol). The data will be used to operate the network, analyze the flow of site alarm and system control data, offer system solutions and handle pre-defined alarm situations automatically. The system provides reports to the engineers and the operators that will help in administering the network. The Network Operations Center (NOC) at the State Police Headquarters (SPHQ) will house personnel on a 24/7 basis to identify, remotely correct alarm conditions or dispatch technicians.

8. Transmitter Sites

The transmitter sites in STARS support the land mobile radio voice, microwave radio, and the mobile data subsystems. Each site's communications equipment is housed in a protective building, and is monitored for technical functions and is protected with emergency power systems and sophisticated grounding systems to protect from lightning damage.

Each site will be implemented using the most efficient and cost conscience process, a methodical approach will be followed which takes into consideration many facets such as: microwave radio path surveys, necessary FAA submittals and approvals, architectural and engineering (A & E) work, and site specific improvements. The major components necessary for the completion of a communication site include, site preparation, radio towers, radio buildings, heating ventilation and air-conditioning (HVAC), backup power systems (UPS, generator and DC Power systems), as well as fencing and other work as defined in the detailed statement of work.

The STARS contract includes 14 tower loading models. This somewhat increases its initial total cost, but reduces technical risk by this measure of completeness. The cost of models or associated quantities that are not needed will be recovered through the change order process.

9. Master Sites and Dispatch Center Renovations

Motorola will provide the Commonwealth with design-build construction services to upgrade four of the seven VSP Communications Centers. They will be constructed as additions to existing VSP Division Headquarters buildings

To reduce the cost of the project, the Commonwealth has assumed the responsibility for construction services of the STARS Network Operations Center (NOC) and Master Site facilities for Motorola to install their equipment. To meet the aggressive schedule, an existing VSP warehouse will be refurbished for the NOC and one of the Master Sites. A new building at Division Six will be constructed to support VSP dispatching and the other Master Site equipment.

10. Voice and Data Subscribers

Motorola will provide the Commonwealth of Virginia Digital Subscribers (portable, mobile, and control station radios), mobile digital vehicular repeaters, and mobile computer terminals for users to operate on the STARS Integrated Voice and Data (IV&D) network. The different models and tiers of ASTRO 25 digital subscribers supplied will enable the Commonwealth agencies to employ the radio types appropriate for their particular operational needs.

11. Integrated Voice and Data Communications

Motorola is providing a VHF Integrated Voice and Data (IV&D) Trunking network that is designed to meet the wireless voice and law enforcement data communications needs of the Commonwealth. This is a significant cost savings as compared with two separate networks.

The communications solution will provide mobile coverage throughout the Commonwealth, including the six major tunnels. It will also interface with designated conventional (non-trunked) and trunked radio systems located in the Commonwealth. Finally, the system will use an integrated infrastructure for voice and data subscribers.

Microwave Telecommunications Subsystem (MTS)
- Leveraging the existing VSP Microwave Network that uses Tadiran equipment to accommodate higher-traffic areas
- Automatic rerouting as needed to avoid delays, congestion and disaster recovery

Land Mobile Radio Subsystem (LMR)
- Standards-based technology for narrowband, VHF, high capacity, trunked system
- Meets the Federal Communications Commission's mandate for improved spectrum efficiency
- Compatible with both analog and other APCO P25 systems (VHF, 700MHz or 800 MHz) used throughout the Commonwealth for direct radio-to-radio interoperability when appropriate

- To reduce the cost of the project, the Commonwealth will assume the responsibility of installing the antenna mounting structures for control stations when a building cannot be used.

Mobile Data Subsystem (MDS)
- Provides remote access to state and federal law enforcement data bases
- Includes interagency messaging system, both car-to-car and to/from fixed computers
- Provides guaranteed message delivery and coverage throughout the Commonwealth (which is not available from commercial wireless services)

Alarm and Control Subsystem (ACS)
- All communications systems and sites are remotely monitored, 24 hours a day and 7 days per week by the STARS Network Operations Center (NOC) (located at State Police Headquarters) and by the Motorola System Support Center during the warranty period, resulting in fewer and shorter outages at remote sites

12. Acceptance Test Procedures

12a. STARS Integrated Voice and Data Acceptance Test Plan

12b. Microwave Network Field Acceptance Test Plan

12c. Automated Vehicle Location Test Plan

12d. Integrated Voice and Data Network Coverage Acceptance Test Plan

The Contract includes detailed acceptance test plans for both functionality and performance. This reduces the Commonwealth's technical risk because of their specificity.

13. Schedule

The contract includes a detailed document that includes the tasks, milestones and contract deliverables.

All member agencies will have their STARS equipment installed along with the State Police field division in which they have operations. The seven State Police field divisions will be operational on STARS by:

Richmond (Division One)	December 2005
Tidewater (Division Five)	May 2008

Culpeper (Division Two)	July 2008
Northern Virginia (Division Seven)	October 2008
Salem (Division Six)	April 2009
Appomattox (Division Three)	May 2009
Wytheville (Division Four)	September 2009

Note: This implementation could be adjusted should Division Seven move into a new facility as is being proposed.

14. Training

Motorola is providing a full suite of both operator and maintenance. Operator train the trainer is being provided for the State Police instructors to train the law enforcement users. Motorola will directly handle the remaining users. The State Police Communications Division engineers and technicians are being trained on the maintenance of all major subsystems so that they can continue to self-maintain the infrastructure and mobile equipment.

15. Warranty and Support

Motorola is providing a one-year warranty on the functionality of the infrastructure and individual items of equipment (three years on the mobile computers). The master site equipment will be maintained by Motorola for the duration of the implementation. Configuration and asset management will also be provided by Motorola. The Commonwealth will assume the inventory control, asset and configuration management functions through the change order process after a suitable internal process is developed. The Commonwealth will purchase most of the test equipment through separate procurements.

The STARS Network Operations Center (NOC) located at SPHQ will be the primary point of contact for all warranty and maintenance issues. The NOC will receive landline calls for maintenance issues and all status alarms from the infrastructure equipment. During warranty, the NOC will notify Motorola who will dispatch service. The NOC will also receive a maintenance call or an alarm on infrastructure that is post warranty, the Commonwealth will have the primary maintenance responsibility and will dispatch Commonwealth technicians accordingly.

The Warranty and Support Plan for STARS combines the services of the Commonwealth's technical staff, local Motorola Service Subcontractors, central Motorola Support Centers, and other specialized technical subcontractors. This approach will enable STARS to maximize the utilization of resources while providing responsive service and maximum system operation and reliability.

At the conclusion of the subscriber warranty period, the VSP Communications Division will be responsible for all law enforcement agencies' equipment and Motorola will be contracted to continue supporting the remainder of the equipment. The VSP Property and Finance Division will continue equipping vehicles for the State Police and Motorola will be contracted for the remaining agencies.

STARS Performance Issues

Available funding and radio frequencies are two resources that are limiting factors for the performance of any radio system. The Commonwealth and Motorola have thoroughly explored the effects of the limitations of these resources to implement a reasonable statewide communications system. The following are some of the issues that were a result.

Coverage: The system is being designed to serve radios mounted in vehicles (mobiles) and not hand-held radios (portables) because they require more transmitter sites. A vehicular repeater is being used so that on-scene portable radio coverage will be available (when within range of the vehicle mounted repeater). This may be a limitation for agencies that do not always have close proximity to a vehicle.

Mobile Data: Secondary status is being imposed on law enforcement mobile data transmissions when the network is serving voice users. The system is being designed so that only two of the transmitters at a given site can service mobile data communications. The file size of attachments has been limited to 15 kilobytes. In addition, the routine passage of mug shots and fingerprints has not been accommodated in the traffic-loading model. The 15 kilobyte file size meets all current needs. Mug shots and fingerprints are not currently sent over Mobile Data Terminals; however, future enhancements will add this requirement. Within two years Motorola anticipates a software upgrade that will increase the file size of attachments to approximately 150 kilobytes that will accommodate mug shots and fingerprints.

Voice Communications: The features facilitated by the ASTRO25 technology being provided will be limited to a less functional message profile in order to maintain an appropriate grade of service (the amount of time a user potentially could wait to communicate). These features can be implemented as required under the management of the STARS Program Director. The locality interoperability subsystem will likewise be managed (locally in this case) because its traffic-loading is also not part of the Contract's performance guaranty.

Migration: Each of the 20 participating agencies uses different operational service areas. The VSP divisional boundaries are being used because STARS is an upgrade to the

existing VSP radio networks. Therefore, some agencies could be delayed access to STARS until their operational service area is completely covered by one or more VSP divisional boundaries.

Project Risk / Risk Mitigation

Insufficient funding by the General Assembly for the entire Systems Integrator Project may result due to economic situations or other priorities.

Impact: Scale back Microwave Network's alternate paths; reduce Voice and Data Network's coverage or features; or reduce the number of users. Failure to appropriate sufficient funds could result in spending substantial sums and only receiving a partially operational radio system.

Mitigation Approach: Provide sufficient validation to the Management Group and Legislature to substantiate funding and the necessity of the project.

The Systems Integrator Contract includes generalizations / approximations from published literature concerning electrical conditions. The radio coverage is dependent on interference due to other transmitters and / or localized electrical noise.

Impact: Lower the coverage guarantees in one or more communications zones or increase the number of land mobile radio transmitter sites. Additional sites may significantly increase the project's total cost-to-complete or may not be feasible if frequencies are not available.

Mitigation Approach: Have funds available to implement additional transmitter sites. If a simulcast solution is not possible due to the distance from the closest operational site, then additional radio spectrum will be needed for the new site or coverage will necessarily be reduced. The procurement of VHF frequencies from Motorola guarantees sufficient radio spectrum to operate the STARS system.

The delivered system does not provide radio coverage in a specific limited area that is necessary / vital for one or more agencies' operations.

Impact: Increase the number of land mobile radio transmitter sites. Additional sites may significantly increase the project's total cost-to-complete.

Mitigation Approach: Have funds available to implement additional transmitter sites. If a simulcast solution is not possible due to the distance from the closest operational site, then additional radio spectrum will be needed for the new site or additional coverage may not be achievable. Prior to implementing a communications zone, the STARS Project

Management Team will review the coverage projections with the User Agency Requirements Committee (UARC) to identify potential coverage issues and attempt to resolve them prior to construction. However, the Contractor is not able to guarantee radio coverage in a specific area in the design phase, only a service area percentage within a communications zone. The coverage maps in the contract or those revised during the design review are for reference only. Motorola has been provided a list of coverage areas that are currently poor so they can work to improve coverage in those areas.

The Systems Integrator's initial design includes assumptions concerning physical conditions. With the exception of 25% of the transmitter sites, best-case conditions (such as 2% onsite grade, 14 foot wide mountain top access roads, rock free soil) have been assumed.

Impact: Unfavorable physical site conditions could significantly increase the cost-to-complete the project or select construction be canceled.

Mitigation Approach: Ensure sufficient funds are reserved outside of the Systems Contract to complete the construction. Note that design parameters or construction alternatives may need to be altered at specific sites to reduce cost. The projected cost of tower sites should cover the cost to improve the transmitter sites and access roads.

The Richmond area implementation schedule is not met.

Impact: Richmond area operations will be delayed. Operational demonstrations that could be needed to receive the next biennium's funding may not occur during the General Assembly session. Non-implemented microwave radio frequencies throughout the state may need to be re-coordinated at additional cost. In general, any unforeseen delays, including radio frequency licensing, site acquisition, Commonwealth site upgrade responsibilities or other such issues, will extend the project's schedule.

Mitigation Approach: Provide adequate work priority and resources for the STARS Project Management Team. Both Motorola and the STARS staff are committed to ensuring the implementation schedule is met.

Suitable transmitter sites are not acquired.

Impact: Significant delays or excessive costs in obtaining land, payment of the contractors' losses due to schedule delays, or jeopardized system performance.

Mitigation Approach: Alternative sites that are less than optimal or design changes will be considered. Otherwise, management needs to be willing to use the granted eminent domain authority, including quick take authority, to allow the project to stay on schedule.

Leased VSP Area Offices will use commercial data lines instead of microwave radio connectivity. Leased data line issues make a VSP Area Office site less suitable for a remote emergency operations center or continuity of government location.

Insufficient Microwave Radio Frequencies.

Impact: Two or more microwave transmitter sites will need to be relocated.

Mitigation Approach: Coordinate all microwave paths immediately upon contract award. Negotiate with current licensees if sufficient spectrum and / or bandwidth is not available. Commercial services can be used as an alternative but monthly cost will be incurred and reliability will be decreased.

Insufficient VHF Land Mobile Radio Frequencies.

Impact: Acquire additional frequencies, which can be expensive. Reduce the number of channels, number of users, or accept reduced performance at the affected transmitter site. Limit the number of small talk groups, which means less privacy on the network. The amount of time any given user may have to wait to communicate is directly related to the number of channels available. The grade-of-service and coverage guaranties in the contract are based upon (and can be revised because of) the number and quality of radio frequencies the Commonwealth has.

Mitigation Approach: Strict Commonwealth control of system loading and radio use after implementation. Partner with localities to share their allocated spectrum if it is underutilized. This may require the Commonwealth to fund a locality's replacement equipment. The procurement of VHF frequencies from Motorola guarantees sufficient radio spectrum to operate the STARS system.

Insufficient 700/800 MHz Land Mobile Radio Frequencies.

Impact: Reduce the number of channels in the vehicular repeaters thereby limiting the number of on-scene talk paths. Note that no channels in these bands have been identified in Northern Virginia, meaning that STARS cannot be implemented there until they are.

Mitigation Approach: Strict Commonwealth control of system loading and radio use after implementation. Partner with localities to share their allocated spectrum (not talk groups on their networks) if it is underutilized. VITA's assistance has been requested for obtaining 700 MHz channels for STARS' use. Significant coordination with the surrounding states and local broadcasters has yet to occur for STARS to have specific 700 MHz channels allocated from the Commonwealth's license (thereby reducing risk). In addition, STARS has to be added to the 700 MHz spectrum planning committees'